SOIL SURVEY OF RICHMOND COUNTY, NORTH CAROLINA.

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DESCRIPTION OF THE AREA.

Richmond County, situated in the south central part of North Carolina, has an area of 464 square miles, or 296,960 acres. It is bounded on the north by Montgomery County, on the east by Moore and Scotland Counties, on the south by Marlboro County, S. C., and

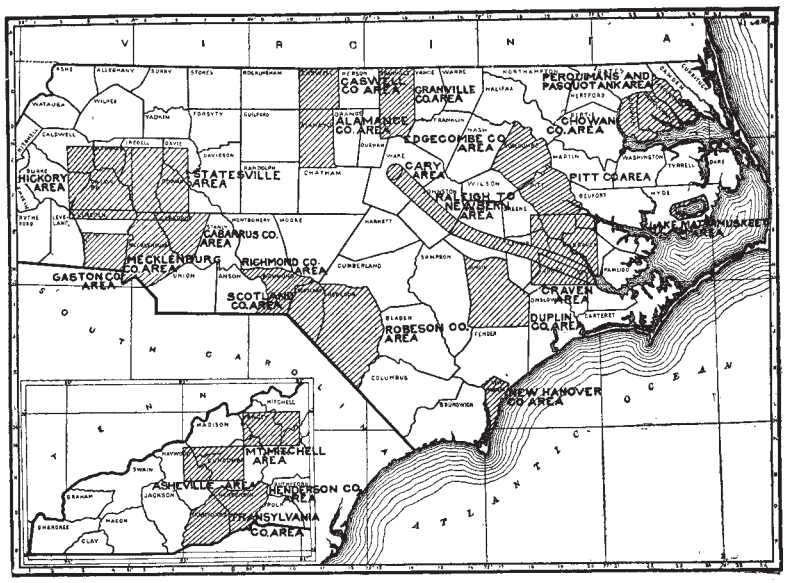

FIG. 8.—Sketch map showing areas surveyed in North Carolina.

on the west by Anson County. The county is very irregular in outline, its northern, eastern, and western boundaries being formed almost entirely by roads or streams. It varies in width from 13 miles at the southern boundary to 26½ miles at the northern boundary, and its maximum length is 26¼ miles.

The topographic features of Richmond County are varied. Extending from the bottom lands of the Pee Dee River, which forms the

western boundary of the county, is a chain or line of hills stretching northward to Little River, where it leaves the river and turns northeast, following in a general way the course of Big Mountain Creek. In the extreme southern end of the county this chain of hills is very narrow, occupying, as it does, only the bluff line overlooking the river bottoms. Farther north, however, it increases in width to nearly 5 miles opposite Rockingham and attains its maximum width of 9 miles between Ellerbe Springs and the Pee Dee River. From this point it gradually narrows to 6 miles at the northern boundary of the county. In the southern extension of these hills many short streams are found, some of which have cut out deep ravines. Going north the streams become less numerous but longer, and here again the valleys are deep and narrow. The fullest development of the hills is reached about midway between Blewett Falls and Covington. In this section the ravines are numerous and many of them are 150 to 200 feet below the crests of the intervening hills. North of Covington the hills continue, but are broader and the stream valleys not so deep. In the northwestern corner of the county a considerable portion of the country is occupied by the level to gently sloping terraces of Pee Dee and Little Rivers. The upland country between these streams is gently rolling to hilly.

Lying immediately to the east of the chain of hills and extending from the southern boundary of the area in a northeasterly direction nearly to Rockingham is a section of country averaging 2 miles in width whose surface is for the most part undulating to gently rolling. As a whole this is the most even-surfaced portion of the county and it is within this section that the most highly developed agricultural lands are found.

Lying east of the undulating country and the chain of hills and comprising the eastern two-thirds of the county is the region locally known as the Sand Hills. The topography of this section as a whole is gently rolling to rolling or even somewhat hilly as the larger streams are approached. From any position commanding a considerable view of the county a great network of sand-hill branches may be seen flowing in various directions through comparatively deep valleys. Many of the interstream areas are quite extensive and usually the best roads of the sand-hill region follow such areas. The surface of the interstream areas is for the most part undulating to gently rolling or rolling.

The regional drainage of Richmond County is effected mainly through streams having their source in the sand hills and flowing in a general southwesterly direction, eventually entering the Pee Dee River. Among these streams are Marks, Falling, Ghock Fork, Rocky Fork, Cartledges, and Little Mountain Creeks.

The north-central part of the county is drained chiefly by Big Mountain and Buffalo Creeks, both of which flow in a southwesterly direction, the former entering the Pee Dee River and the latter Little River. The drainage of the northwestern corner of the county finds its way into the Pee Dee River mainly through Little River. The northeastern part of the county is drained by Drowning Creek and its tributaries, the largest of which is Naked Creek.

From the direction of the drainage it is evident that the general slope of Richmond County is to the southwest, a fact which is borne out by a series of elevations taken across the county. Hoffman, the most easterly railroad station in the county, is 427 feet above sea level, and from this point the elevation drops to 211 feet at Rockingham. Cognac, 7 miles southwest of Hoffman, is 350 feet above sea level, and Hamlet, 6 miles southeast of Rockingham, has an elevation of 325 feet above sea level.

Along the various streams many dams have been built and the water power utilized for operating grist mills, cotton mills, and electric-power plants. In the vicinity of Rockingham there are 10 cotton mills, 6 of which are operated wholly or in part by water power generated at local dams. These mills represent an aggregate capital of $1,950,000 and operate 103,388 spindles and 3,068 looms. At Blewett Falls, on the Pee Dee River, 7 miles northwest of Rockingham, there is under construction a hydro-electric plant which will generate 32,000 horsepower. Backwater from the dam, which is 1,760 feet long and 60 feet from base to top, will form a lake 7½ miles long and 2 miles wide in some places and will make the river navigable, with one lock, for 33 miles.

Richmond County embraces territory segregated from Anson County in 1779. The county originally included an area of about 700 square miles, but in 1899 four townships were cut off and, together with a section of Robeson County, incorporated as Scotland County.

The majority of the early settlers were of Scotch ancestry, and devoted themselves mainly to stock raising. They settled first in the vicinity of Wilmington and then, in search of new grazing lands, passed up the Cape Fear River to Fayetteville and over into what is now the southern part of Richmond County. At about the time of the Scotch settlement many English settled along the Pee Dee River and in the western and northwestern sections of the county. At a much later period these settlers were joined by other Englishmen, and to-day probably the greater proportion of the white population is of English descent. The census of 1910 gives the population of the county as 19,673, about equally white and negro.

Rockingham, the county seat, was established in 1781. It is a thriving town, with well-paved streets, waterworks, and electric-

lighting plants. In addition to the 10 cotton mills in this vicinity, there are located in and near the town a mattress factory, two lumber manufacturing plants, a machine and foundry plant, and other smaller manufacturing enterprises.

Hamlet, with a population of 2,173, is situated in the south-central part of the county and is one of the largest railroad centers in North Carolina. A number of manufacturing enterprises are also located in this town. Like Rockingham, it has an excellent system of waterworks and electric lighting. Roberdell and Steeles Mill are small but thriving cotton-mill towns. Hoffman, Ellerbe, and Osborne are also prosperous towns, each of them well situated with respect to railroads. Mangum, Littles Mills, and Covington are post-office villages. Ellerbe Springs, a summer resort, is situated in a picturesque spot on the margin of the Piedmont Plateau and Atlantic Coastal Plains.

The southern part of Richmond County is well supplied with transportation facilities. From Hamlet the lines of the Seaboard Air Line Railway traverse the county to the east, south, and west. For distant points ready connection for both passengers and freight can be made in every direction. The North & South Carolina Railway also enters Hamlet, offering transportation to various points in South Carolina. The Rockingham Railroad, now under construction, will ultimately connect Rockingham and Gibson, thus establishing competition between the Seaboard Air Line and Atlantic Coast Line. A branch line of the Aberdeen & Asheboro from Candor to Ellerbe taps a large section in the northern part of the county.

The dirt roads throughout the greater part of Richmond County are in good condition. More than 300 miles of sand-clay roads have already been built and this work is still going on. The greatest activity in road building is at present being shown in the sand-hill section of the county, more especially in the vicinity of Hoffman.

CLIMATE.

The winters are short and not excessively cold and the summers are long and hot. Snow falls occasionally during the winter months, but remains on the ground for only a short time. The prevailing winds in summer are from the south and southwest. The rainfall is quite evenly distributed throughout the year and crops seldom suffer severely on account of droughts. The following table, compiled from the records of the Weather Bureau station at Rockingham, gives the normal and absolute maximum and minimum monthly and annual temperatures and mean monthly and annual precipitation, the amount for the driest and the wettest years, and the average depth of snow:

Normal monthly, seasonal, and annual temperature and precipitation at Rockingham.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
December	43	77	7	3.6	3.4	5.4	1.9
January	41	76	— 2	3.1	1.4	2.2	1.6
February	43	80	—15	5.1	6.6	1.7	3.7
Winter	42	.....	.....	11.8	11.4	9.3	7.2
March	54	89	17	3.6	4.8	4.0	T.
April	61	97	28	3.6	2.7	4.6	T.
May	71	102	38	4.0	2.4	10.6	0.0
Spring	62	.....	.....	11.2	9.9	19.2	T.
June	77	102	45	5.4	5.1	11.1	0.0
July	80	103	55	6.3	5.0	9.4	0.0
August	79	103	54	6.4	3.0	12.4	0.0
Summer	79	.....	.....	18.1	13.1	32.9	0.0
September	74	100	41	3.7	0.7	0.4	0.0
October	62	91	30	3.2	3.9	0.8	0.0
November	52	87	14	2.6	0.8	5.4	T.
Fall	63	.....	.....	9.5	5.4	6.6	T.
Year	61	103	—15	50.6	39.8	68.0	7.2

Average date of first killing frost in autumn, Nov. 2; of last in spring, Apr. 10. Date of earliest killing frost in autumn, Oct. 2; of latest in spring, Apr. 24.

AGRICULTURE.

The first settlements in the present territory of Richmond County were made during the latter half of the seventeenth and early in the eighteenth century, but no material progress was made along agricultural lines until about the time of the Revolutionary War. Prior to this time the chief pursuit consisted of grazing cattle and sheep. The wire grass of the sandy lands and the cane or reeds of the bottoms are said to have afforded ample pasturage. During this stage of agricultural development the settlers moved from place to place seeking new feeding grounds, and in doing so cleared the most fertile spots, on which corn and wheat were grown for home use. During the earlier days of the stock-raising industry the cattle and sheep when ready for market were driven to Philadelphia and later to Fayetteville, Wilmington, or Cheraw. Not more than one or two trips each year were made to the more distant markets, and from

these places such necessaries as could not be grown at home were brought.

The chief crops during this period were corn, wheat, and oats, all of which were grown only in the western part of the county on the soils now locally known as the "stiff lands." Hogs were raised to supply the home demand. Cotton was grown to some extent, and the lint was picked from the seed, spun, and woven at home. Indigo was grown to a limited extent and served as a money crop.

As the development of this section of North Carolina progressed the production of corn, wheat, and oats increased, and these continued to be the principal crops until about the time of the Civil War.

The sand-hill section of the county attracted no attention until about 1850, when the turpentine industry was introduced. This industry, however, did not materially affect the agriculture of the county, for the western third of the area, wherein the county's agriculture was carried on, contained no longleaf pine, the source of turpentine. The turpentine supply was soon exhausted, and about 1875 lumbering became important in the sand-hill region, where it is still carried on to some extent, though only a small quantity of marketable timber remains. Tar was also secured in considerable quantities. At present the manufacture of lumber from shortleaf pine in the northwestern section of the county is of considerable importance.

Cotton growing was carried on rather extensively many years before the Civil War, an evidence of which is seen in the erection of a mill in 1846. This mill was burned in 1865 by the Federal Army, but was rebuilt in 1868 and is still in operation. The erection of this mill was soon followed by others. Pee Dee No. 1 was built in 1874, Roberdell No. 1 in 1878, and then followed Ledbetter, Pee Dee No. 2, Steeles Mill, Roberdell No. 2, Hannah Pickett, and Entwistle, the last having been completed in 1910. Beginning with the reconstruction period the increase in the production of cotton was rapid, and by the year 1875 it had become the most important crop of the county, while the raising of cattle and sheep and the production of corn, wheat, and oats had decreased proportionately. Cotton has continued to be the most important crop to the present day, though in 1899 a slightly larger acreage was devoted to corn. During this year, according to the census of 1900, 22,909 acres were planted to cotton and the aggregate yield was 11,261 bales.

In 1909 (census of 1910) there were 22,141 acres in cotton and the production was 13,333 bales. At present the county produces from 14,000 to 16,000 bales annually, all of which is used by local mills.

The production of corn is next in importance to cotton. In 1899 there were 23,190 acres devoted to this crop, with a total yield of

220,320 bushels. By 1909 the acreage had declined to 16,158, from which, however, 209,551 bushels were harvested.

The production of wheat, oats, and rye is also of considerable importance in Richmond County. In 1909 there were planted to wheat 680 acres, yielding 4,466 bushels, and to oats 3,633 acres, which produced 51,254 bushels. The acreage of the former decreased and of the latter increased during the decade preceding. Rye is used chiefly as a grazing or cover crop. Only 1,870 bushels were produced in 1899, while the 1910 census reports no rye except as hay. Sorghum, Irish potatoes, and sweet potatoes are grown for home use only, as are also peanuts. The latter should become an important crop as the development of the sand-hill country progresses.

Systematic crop rotation is not generally practiced. Cotton is grown continuously on the strongest upland soils and to some extent on the bottom lands. Corn and oats are planted on bottom lands where drainage is insufficient for cotton. The most successful farmers recognize the value of crop rotation, but it is claimed that "rotation can not be afforded where cotton is worth 14 to 15 cents per pound." In general, too few crops are grown for a successful rotation.

Improved farm machinery is not in general use even upon soil favorable to its use. Considerable deep plowing with two-horse plows is done, but this is not the case in all parts of the county.

Stock feeding and dairying are practiced to a limited extent only. The principal pastures consist of fenced river bottoms too poorly drained for cultivation. Tame grasses for pasturing were seen in one or two instances only. Cattle occasionally are allowed to graze on the cultivated land after the crops have been gathered. One or two cows to supply milk and butter for home consumption are found on each farm. Large pastures for hogs are not maintained, as no pork is raised except for home use and the local markets.

When seasons are favorable various summer fruits are plentiful, but no winter varieties are grown. Dewberries are the only fruit grown for shipment. The sand-hill region is admirably adapted to the production of this crop. The value of all orchard products in 1899 was only $340. Dewberries had not been introduced at this time. Pears suffer to some extent from blight, except in the sand-hill region. Peach trees in this district yield abundant fruit of good quality, and there is no apparent reason why fruit growing can not be carried on here on a commercial scale. Scuppernong, Concord, and other grapes are grown throughout the county for home use.

As cotton is the most important crop in the county, it is given the preference in regard to soils, cultivation, and fertilization. The fertilizer practices vary in different sections of the county and with different planters. In general the greatest quantities are used in sections where railroad transportation is best. Near Rockingham

the majority of farmers use heavy applications of a home-mixed fertilizer which would analyze approximately 8–4–4, 7–4–4, or 7–5–4. Generally this is used in two applications—400 to 800 pounds at planting time and 100 to 200 pounds when the cotton is ready to bloom. Some farmers use 500 pounds per acre of an 8–3–3 mixture at planting time and 75 to 100 pounds of nitrate of soda as a top dressing at the last plowing. Near Covington and Mangum, and in other sections where there are no railroad facilities, smaller quantities are used. In the sand-hill regions applications in many instances are as heavy as on the stronger soils.

Fertilization methods with corn are more varied than with cotton. Some planters use 400 pounds per acre of 8–2–2 or 8–3–3, 100 pounds of which is applied at planting time and the remainder at the next to the last plowing, with 75 to 100 pounds of nitrate of soda at the last plowing. Others use a higher grade fertilizer (7–4–4 or 7–5–4), applying 100 pounds at planting time and 300 pounds at next to the last plowing, with 75 to 100 pounds per acre of a mixture of nitrate of soda and kainit at the last plowing.

The labor of Richmond County is largely negro and is plentiful in most sections. Farther away from the towns negro women receive 50 cents per day, while negro men receive 60 cents per day. Plow hands receive $12.50 to $15 per month and board. Nearer the towns wages are somewhat higher. According to the census of 1910, $115,617 was expended for labor in 1909.

Most of the farms of Richmond County are owned by a comparatively few men. Many of them contain 500 to 1,500 acres, the greater part of which is improved land. Several men in the county own 18,000 to 20,000 acres, but this is unimproved land rather than farm land. There were 1,621 farms in the county in 1910 as against 1,462 in 1900.

The greater proportion of the farms are operated under the tenant system, only 40.6 per cent being operated by the owners in 1900 and 42.3 in 1910. Different systems of tenancy are in practice. There is a larger number of farms rented for cash than in most counties of the State, though share tenants are greatly in the majority. When the landowner furnishes stock, implements, keeps up repairs, feeds stock, and furnishes one-half of the fertilizer each takes a half of all crops, except oats, cotton seed, and pea-vine hay, all of which goes to the landlord. Under another plan the tenant furnishes stock, implements, and labor, and keeps up repairs, while the landlord furnishes all the fertilizer, land, gins cotton free, and furnishes bagging and ties, and each takes half of all crops.

There has been a great advance in the price of agricultural lands within recent years. Ten years ago any of the sand-hill lands could be bought for $2.50 to $3 an acre, but at present the price ranges

from $2.50 to $50 an acre, while the heavier lands of the county are now worth from $20 to $100 an acre. The average actual value of cotton land near Rockingham is $60 an acre, though much of this can not be bought for less than $100 an acre.

Much of the soil in Richmond County is in a state of high productiveness, but there is still much room for improvement in the farm practices. Most of the soils are low in humus, a defect which could be remedied by turning under cowpeas, velvet beans, soy beans, or clover. More stable manure is needed, which can be cheaply produced in those sections of the county where the soil is well adapted to forage crops. The feeding of cattle would be beneficial not only in producing stable manure but also in establishing crop rotations, as a number of minor crops would need increased acreages. The planting of winter cover crops will also be found very beneficial and should be more generally practiced. Deeper and more thorough plowing, using plows of heavy draft, should be more general and should always be followed by shallow and frequent cultivations in order to conserve soil moisture. More attention should be given to the matter of seed selection, especially in the case of cotton and corn.

While many farmers employ excellent methods, there is plenty of room for general improvement. More crops should be grown, especially more of the legumes, to supply nitrogen, a costly ingredient of fertilizers, and the organic matter that most of the upland soils need badly. The best general farm crops for market, forage, and soil-improving purposes are cotton, corn, oats, peanuts, sorghum, cowpeas, soy beans, velvet beans, Bermuda grass, rye, crimson clover, bur clover, rape, and bottom-land grasses, like meadow-oat grass, fescue, and redtop.[1]

Summer apples, peaches, plums, blackberries, dewberries, and strawberries offer opportunities for the development of a greater fruit industry to supply the home demands, the needs of the grower himself, and to share in supplying the early summer markets. A great variety of vegetables can be grown to a larger extent both for home use and for shipment. Watermelons, cantaloupes, cucumbers, tomatoes, sweet potatoes, Irish potatoes, cabbage, collards, squash, garden peas, asparagus, radishes, lettuce, snap beans, beets, egg plant, turnips, and peppers are among the vegetables that would do especially well.

[1] For further discussion of methods of handling crops particularly suited to the varied soils of Richmond County see the following Farmers' Bulletins of the U. S. Department of Agriculture: No. 312, A Successful Southern Hay Farm; No. 318, Cowpeas; No. 324, Sweet Potatoes; No. 333, Cotton Wilt; No. 356, Peanuts; No. 361, Meadow Fescue; No. 372, Soy Beans; No. 407, The Potato as a Truck Crop; No. 414, Corn Culture; No. 415, Seed Corn; No. 427, Barley Culture in the Southern States; No. 278, Leguminous Crops for Green Manuring; No. 436, Winter Oats for the South; No. 433, Cabbage; No. 243, Fungicides and their Use in Preventing Diseases of Fruits; No. 220, Tomatoes; No. 198, Strawberries; No. 164, Rape as a Forage Crop; No. 246, Sorghum Forage.

SOILS.

Richmond County embraces a diversity of soils adequate for the development and maintenance of a varied, intensive, and profitable agriculture. Owing to the wide range of soil-forming materials, there are marked differences in the soils often within an area of a few acres. Twenty-three distinct soil types were mapped. Patches of still other types were seen, but these were either too small to map on the scale used (1 inch to the mile) or were too intricately associated with other more important and extensive types to be delineated. Such soils, however, are of little importance, on account of their small total extent. They have been described under the several type heads with which they are associated to avoid confusion as to identity of the soil of a particular field on the part of those who carefully follow the descriptions. The important soils all have a strong individuality, so that it was not a difficult matter to map them, but they grade into one another in places in such a way that the lines of separation often had to be drawn somewhat arbitrarily.

The classification of the different soils is based principally upon differences in origin of the soil material; the texture or relative content of gravel, sand, silt, and clay; the structure or properties of compactness, porosity, plasticity, and friableness; color as indicative of some inherent soil characteristic; and drainage condition. These characteristics, together with the topographic features, govern in a large measure the crop adaptation of the various grades of land, the condition of the soil with respect to moisture, the cultural processes, and the consequent productivity. Those soils having close similarity in point of origin, color, and other prominent physical characteristics have been grouped in series for convenience of treatment and correlation.

Three well-defined divisions or soil provinces are embraced within the limits of Richmond County: (1) The Piedmont province, including soils representing the residual products coming from the decay in place of the various rocks of the region; (2) the Coastal Plain province, including old sedimentary soils that were deposited in the prehistoric sea that once covered a large part of the county; and (3) the recent alluvial soils, representing materials deposited over the flood plains of the streams.

The Piedmont Plateau division is roughly confined to the western third of the county, to the north and west of Rockingham. It varies in width from about 6 miles between Rockingham and the Pee Dee River to nearly 18 miles from the river eastward along the northern county line. The present line of separation between the Coastal Plain and Piedmont divisions is approximately from Pee Dee River

along the west side of the River Road to Rockingham, and thence in a northeasterly direction to Ellerbe, from which place the division line runs almost due north to the county line near Mount Carmel Church. Isolated patches of Coastal Plain soils occur within the limits of the present Piedmont belt, representing remnants of a former mantle of sedimentary material. The Coastal Plain material originally extended farther west than at present, the overlapping deposits having been washed off through the ages that have elapsed since the recession of the sea. Likewise there are patches of Piedmont soil within the Coastal Plain belt near the boundary line between the two divisions.

The several soils of the Piedmont division owe their characteristics mainly to the rocks from which they have been derived through the agencies of weathering and to subsequent action of erosion upon the residual material. Through the physical action of heat and cold and the chemical action of water charged with various rock-dissolving components and the influence of plant life, acting through ages, the rocks have been disintegrated and decomposed to give rise to sandy, clayey, and silty soils, according to the character of the original rock, the completeness of the decay, and the subsequent action of rain water in washing out the fine grains.

The Cecil soils, which are characterized by the gray to red color of the surface soils and the red color and clay texture of the subsoils, have been derived largely from granite and gneiss. Three members of this series were mapped, the gravelly loam, sandy loam, and clay.

From the dark-colored, fine-grained, hard diorite the Iredell loam has been formed. The most prominent characteristic of this type is the very sticky, plastic, unwieldy, heavy clay subsoil.

The light-gray to bluish-gray fine-grained slates known as "Carolina slates" have broken down, giving rise to two fine-textured soils, the Georgeville and Alamance silt loams. The former has a red and the latter a yellow subsoil. Two other groups of soils have been formed through the weathering of the brown to Indian-red sandstone of Triassic age, the Granville and Penn series. The Granville series, including a gravelly loam, coarse sandy loam, and fine sandy loam, is characterized by the grayish to yellowish-gray color of the soils and the yellow or mottled yellow, gray, and Indian-red color of the subsoils. Only one member of the Penn series is developed in the county, the Penn silt loam, which has a characteristic Indian-red color in both its soil and subsoil.

In the Coastal Plains division there are five soil series, the Norfolk, Orangeburg, Greenville, Hoffman, and Portsmouth. The Coastal Plains soils represent the weathered products of unconsolidated water-deposited material that was washed from the mountains and the

Piedmont Plateau, deposited in an ancient sea, and subjected to the assorting and abrasive action of waves and tides.

Subsequently to the recession of the water this sedimentary material has been subjected to such modifying influences as wind, water, chemical action, and plant life. Probably some of the material had distinctive characteristics at the time of emergence. The sand-hill lands, for example, were unquestionably markedly different in topography from the flat Norfolk and Orangeburg soils at the time of the emergence of the respective areas. It is not unlikely that the peculiar Hoffman sandy loam, with its variegated subsoil and frequent content of soft, white material (possibly kaolin or kaolinized feldspar), was originally different from the Norfolk soils, with their bright yellow subsoils.

Of the Norfolk series two types were mapped, the Norfolk sandy loam and the Norfolk coarse sand. A Sandhill phase of the Norfolk coarse sand was separated from the typical gently rolling to flat soil.

Two groups of red soils were recognized in the Coastal Plain division: (1) The Greenville, which is red from the surface downward; (2) the Orangeburg, which is grayish in the surface portion and red in the subsoil. The Orangeburg sandy loam and gravelly sandy loam and the Greenville sandy loam were the types established.

In a number of depressed situations having poor drainage small areas of the Portsmouth loam were mapped. This type is nearly black in its surface soil, which contains considerable organic matter. It has a grayish subsoil.

The Bradley sandy loam represents a transitional soil type—a Coastal Plain-Piedmont soil. Its surface soil is grayish, like the Norfolk, while its subsoil more closely resembles the Cecil subsoil. It really represents a mantle of Coastal Plain or sedimentary material deposited over Piedmont or residual material. To the westward the Coastal Plain deposits gradually thin out, and finally give way to the purely residual soils of the Piedmont Plateau.

The third soil province, the stream bottoms, comprises two series, the Congaree and Altavista, together with Swamp. The material entering into these bottom lands represents soil that was washed down from the drainage basins of the streams and deposited over the present and former flood plains during periods of overflow. The Congaree soils comprise first-bottom alluvial material having a brownish to reddish-brown color and about the same general character from the surface downward. These Congaree soils are overflowed frequently, additional material being deposited at each successive overflow, so that the action of rain water has not been given the opportunity to bring about as definite a division between the surface soil and the subsoil as in the case of lands not subject to overflow; that is, there has been no chance for the finer particles to

be washed out or carried down toward the subsoil as in the uplands. Only two types—the Congaree fine sand and the Congaree loam—were encountered.

The Altavista silt loam and Altavista loam represent older alluvial soils. They are developed on second bottoms or stream terraces and represent material deposited by the streams when flowing at higher levels than at present. They are characterized by grayish soils and yellowish or mottled yellow, gray, and red subsoils. The type mapped as Swamp comprises alluvial material which is covered by water throughout all or a considerable part of the year. The constituent material is so variable in texture that type differentiation would be very difficult.

The following table shows the relation of the various types to one another in point of origin and characteristic features:

Region and process of formation.	Color and origin.	Type.
Residual soils: Piedmont uplands	Gray to red soils; red clay subsoils. Mainly from granite and gneiss.	Cecil gravelly loam. Cecil sandy loam. Cecil clay.
	Gray to black soil; yellowish to greenish-yellow sticky, plastic clay subsoil. Mainly from diorite.	Iredell loam.
	Indian red soil and subsoil. From Triassic sandstone.	Penn silt loam.
	Gray to yellowish-gray soils; yellow to mottled yellowish and red sandy clay subsoils. From Triassic sandstone.	Granville gravelly loam. Granville coarse sandy loam. Granville fine sandy loam.
	Gray to white soil; yellow silty clay subsoil. From fine-grained slates.	Alamance silt loam.
	Red soil; red silty clay subsoil. From fine-grained slates.	Georgeville silt loam.
Sedimentary - residual upland soil	Gray sandy loam soil (Coastal Plain material); red to reddish-yellow clay subsoil. (Piedmont residual material.)	Bradley sandy loam.
Sedimentary upland soils: Coastal Plain uplands	Gray soils; gray to yellow subsoils. Well drained.	Norfolk coarse sand. Norfolk sandy loam.
	Gray to grayish-brown soils; red, friable sandy clay subsoils. Well drained.	Orangeburg gravelly sandy loam. Orangeburg sandy loam.
	Red soil; red, friable sandy clay subsoil. Well drained.	Greenville sandy loam.
	Gray soil; reddish to mottled red, purple, yellow and gray compact sandy clay subsoil. Well drained.	Hoffman sandy loam.
	Black soil; gray to mottled gray and yellow sandy clay subsoil. Poorly drained.	Portsmouth loam.

Region and process of formation.	Color and origin.	Type.
Alluvial soils: Stream-bottom land	Gray soils; yellow to mottled yellow, gray and red silty clay subsoils. Second bottom, imperfectly drained.	Altavista silt loam. Altavista loam.
	Brown to reddish-brown or chocolate red soils with little change from surface downward. First bottom, subject to overflow.	Congaree fine sand. Congaree loam.
	Friable first bottom alluvial soil, covered with water all the time or for a considerable part of the time.	Swamp.

Detailed descriptions of the several soil types, together with their crop adaptations, crop values, and requisite cultural methods, are given in subsequent pages devoted to each soil separately. These should be carefully considered in connection with any use made of the accompanying soil map.

The following table gives the names and extent of each soil mapped in the county:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Norfolk coarse sand	40,704	51.2	Greenville sandy loam	4,096	1.4
Sandhill phase	111,424		Granville fine sandy loam	3,776	1.3
Georgeville silt loam	24,512	8.3	Penn silt loam	3,264	1.1
Norfolk sandy loam	16,640	5.6	Granville coarse sandy loam	3,008	1.0
Swamp	15,296	5.2	Cecil sandy loam	2,432	.8
Congaree loam	14,208	4.8	Congaree fine sand	2,112	.7
Orangeburg sandy loam	13,056	4.4	Altavista silt loam	1,792	.6
Bradley sandy loam	8,896	3.0	Alamance silt loam	1,472	.5
Orangeburg gravelly sandy loam	6,336	2.1	Iredell loam	1,344	.5
Altavista loam	6,080	2.0	Portsmouth loam	960	.3
Cecil clay	5,376	1.8	Granville gravelly loam	640	.2
Cecil gravelly loam	4,864	1.6			
Hoffman sandy loam	4,672	1.6	Total	296,960	

NORFOLK COARSE SAND.

The Norfolk coarse sand in its typical development consists of 6 to 10 inches of light-gray to slightly yellowish-gray, loose, medium to coarse sand, underlain by a light-yellow to grayish-yellow medium to coarse sand. Included with the type are some areas, too small to map, in which the sand varied from a loamy, coarse sand to a light coarse sandy loam, overlying a sticky sand to sandy loam. Such areas really represent the Norfolk coarse sandy loam. They are more retentive of moisture and consequently more productive than the typical soil.

Local variations in this type are of frequent occurrence. In places the surface inch or so carries an appreciable quantity of decomposing vegetable matter, which imparts a rather dark gray color, while in other places the vegetable-matter content is almost entirely lacking and the immediate surface soil is very light.

Occasional areas are found occupying slight depressions where the soil is brownish-gray or even slightly red and decidedly loamy in structure, with a noticeable clay content.

Areas of Norfolk coarse sand and of its sand-hill phase, which is by far the more extensive, occupies the greater part of the eastern portion of the county. The type forms 51.2 per cent of the area of the county. The most extensive single body of the typical soil is found in the northeastern corner of the county. It occupies the greater part of the country between Naked Creek and Drowning Creek. The typical soil is also developed immediately north of Rockingham and in the vicinity of Roberdell. Numerous other smaller areas are found south of Rockingham and a short distance from Hamlet.

The topography of the Norfolk coarse sand varies from level and gently undulating to rolling, and as the streams are approached low hills are encountered. The interstream portions of the area in the northeastern corner of the county are for the most part level, or at most only gently rolling. In the vicinity of Rockingham and Hamlet the surface of the typical soil is usually rolling. The open and porous structure of this soil, together with its predominantly rolling surface, has resulted in excellent natural surface drainage.

The Norfolk coarse sand owes its origin principally to the unconsolidated sands and sandy clays of marine origin, possibly the Columbia formation. The component materials of the type came originally from the mountains and Piedmont Plateau region and consist, therefore, of the weathered products of granite, gneiss, gabbro, diorite, schists, and slate, together with many other highly crystalline, igneous, and metamorphic rocks. These materials were washed into the sea that once covered the country occupied by this soil. The soil appears to constitute a part of an old shore line and to have been reworked by the waves and tides. Since the elevation the materials have undergone considerable weathering.

The native vegetation on the Norfolk coarse sand consists for the most part of scrub oak. On some areas white oak, hickory, red oak, and dogwood, together with a few longleaf pines, are found. Originally the type supported a valuable growth of longleaf pine, but most of this has been removed.

The principal crops grown on the Norfolk coarse sand are cotton, corn, and cowpeas. Until recent years the yields of all crops on this soil were very low; and even now they vary greatly, depending upon

methods of fertilization and tillage. Formerly an acreage application of 200 to 300 pounds of an 8–2–2 or 8–3–3 fertilizer was made and only one-fourth to one-third of a bale per acre of cotton was gathered. The use of light applications of a low-grade fertilizer is rapidly disappearing and heavier applications of a higher grade are becoming the general practice. The most successful planters now apply 650 to 1,000 pounds per acre of an 8–4–4, 7–4–4, or 7–5–4 mixture and secure yields of two-thirds to 1 bale per acre.

Corn is given an acreage application of 225 to 500 pounds of 8–2–2, 8–3–3, or 7–4–4 mixture, the yields ranging from 10 to 25 bushels per acre. This soil is well suited to the production of various fruits and vegetables, but they are grown only for home use. Peaches, plums, blackberries, dewberries, and early vegetables do well under proper soil management and with fertilization.

With the exception of small areas, humus is almost entirely wanting in this soil, a condition which should be remedied by turning under cowpeas, vetch, soy beans, or some other leguminous crop. Clovers can not be recommended. Cover crops will also prove especially beneficial. In this connection it is suggested that rye be sown between the cotton rows in October or November and allowed to remain until spring, when it should be turned under.

This soil is sufficiently loose and porous to permit a free downward movement of water, and deep breaking is not necessary unless large quantities of vegetable matter or stable manure are to be turned under. Even in this case too much of the subsoil should not be turned up at one time, but the depth of the soil should be gradually increased each year.

The best portions of the Norfolk coarse sand are worth $20 to $50 an acre.

Norfolk coarse sand, Sandhill phase.—The Norfolk coarse sand, Sandhill phase, to a depth of 6 to 8 inches, consists of angular or subangular, medium to coarse, loose, incoherent sand. This is underlain by a pale-yellow, loose, incoherent, medium to coarse sand, extending to a depth of 30 to 36 inches, where it may or may not grade into yellow loamy material.

The surface few inches of the type usually contains sufficient organic matter to impart a grayish color, but in many instances this content is so nearly lacking as to make the immediate surface soil nearly white. Occasional depressed areas show a soil usually somewhat darker colored and more compact or coherent than the average of the type. The subsoil here is a white, incoherent, medium to coarse sand, grading at 24 to 30 inches into a yellow and more loamy material.

The Norfolk coarse sand, Sandhill phase, is typically developed in the vicinity of Cognac and northward from this point to Naked

Creek. The topography is gently undulating to rolling, becoming more rolling and somewhat hilly and broken as the streams are approached. Some of the interstream areas are comparatively large, and usually their surface is undulating to gently rolling. The town of Hoffman is built on one of the largest and least rolling of these interstream areas.

This is one of the most representative soils of the sand-hill belt. It is of marine origin and represents an old beach line. The material has been referred to the Columbia formation by geologists.

Originally the type was forested with a valuable growth of pine, but most of the merchantable timber has been cut off.

Only a small proportion of the Norfolk coarse sand, Sandhill phase, is under cultivation. The principal crops are cotton and corn, and the yields are light. The poorest areas will produce but little of the staple crops. Some portions do not produce more than 300 pounds of seed cotton per acre, regardless of care exercised in fertilization and tillage. However, the proportion of the type giving excessively light yields is relatively small, and from these nonproductive areas the type gradually merges into typical Norfolk coarse sand. In many instances the graduation is so imperceptible that it is almost impossible to draw any definite boundary between the two soils. With heavy fertilization and careful methods of tillage the yield of cotton ranges from one-fifth bale per acre on the least-productive areas to two-thirds bale per acre as the type approaches the typical Norfolk coarse sand in character.

The Norfolk coarse sand, Sandhill phase, is lower in humus content than any other soil of the area. A considerable proportion of the type, though light for the general farm crops, can be built up into a fairly productive soil. To accomplish this the use of leguminous crops is one of the cheapest and most effective means. If cowpeas are grown for soil improvement, they should be turned under about the time the blooming stage is reached. Cover crops to protect the soil during the winter will also prove beneficial, and of these probably no better one than rye can be selected. It should be sown in October or November and turned under in the spring. When humus is once fairly well incorporated in this soil a systematic rotation of crops should be inaugurated and maintained.

Besides cotton, corn, and the legumes, the following crops, though grown at present only for home use, can be grown advantageously in the rotations: Cantaloupes, watermelons, Spanish peanuts, sweet potatoes, Irish potatoes, and various other vegetables. But probably the greatest value of the Norfolk coarse sand, Sandhill phase, lies in its adaptation to the production of fruits, and in particular peaches, grapes, and dewberries. In one or two instances profitable

dewberry farms are now in operation near Hoffman. It is believed that fruit growing will be extended.

Crops suffer severely in dry seasons, a fact that points to the need of liberal incorporation of vegetable matter.

As cotton yields on this type range from one-fifth to two-thirds bale per acre and corn in proportion, the value of the soil is low, ranging from $2.50 or $3 to $20 an acre.

NORFOLK SANDY LOAM.

The Norfolk sandy loam consists of 7 to 10 inches of gray or dark-gray loamy sand to light sandy loam, passing usually into a lighter-colored or pale-yellow material, which continues to a depth of 16 inches, where it grades into a heavy, friable, yellow sandy loam to sandy clay. It frequently happens that the intermediate stratum is absent or, at most, only 1 or 2 inches thick.

The subsoil beneath the typical phase of this type is a yellow, heavy sandy loam to sandy clay of a friable structure. Occasionally the texture of both soil and subsoil is nearly as coarse as in the case of the Norfolk coarse sand. Where the type borders the Cecil or Orangeburg soils red mottlings in the lower portion of the subsoil are of frequent occurrence.

The Norfolk sandy loam occurs for the most part near the boundary line between the Sand Hills and the Piedmont section of the county. Along or near this line it is found scattered entirely across the county. The largest and most typically developed area is 5 miles southwest of Rockingham, along the River Road. Several small areas occur in the sand-hill belt.

The surface configuration of the Norfolk sandy loam varies from gently undulating to gently rolling. Low hills are encountered as the streams are approached, but areas of such rough topography are relatively small. Over most of the type the drainage is well established. The surface in most instances is not rolling enough to induce erosion and yet is sufficiently undulating to carry away all excess surface waters. The type is of marine origin, having been formed in the same way as the Norfolk coarse sand.

Scarcely any of the type remains forested. The original timber growth consisted of oak, hickory, dogwood, and longleaf pine, and occasional small areas covered with this growth are still seen.

The Norfolk sandy loam is a strong, productive soil. It is held in high esteem for cotton and corn, which are the principal crops grown on it. Near Rockingham and within a radius of 10 or 12 miles from that city the type is highly fertilized, and good crop yields are secured. With an acreage application of 650 to 1,000 pounds of an 8–4–4, 7–4–4, or 7–5–4 mixture cotton yields an average of nearly 1

bale per acre. For corn an acreage application of 225 to 500 pounds of 8–2–2, 8–3–3, or 7–5–4 mixture is made, the yields ranging from 15 to 40 bushels per acre, with an average of about 25 bushels. These fertilizers can be prepared on the farm to advantage by mixing cottonseed meal, acid phosphate, and kainit or other carriers of nitrogen, phosphoric acid, and potash.

This soil is well suited to a wide range of crops, many of which are not grown at all or only to a limited extent. Bright tobacco of the kind used in cigarette and granulated smoking tobacco would do well on this soil. This crop was at one time grown to some extent, but was soon discontinued in favor of cotton. The Norfolk sandy loam is also especially well suited to Irish potatoes, sweet potatoes, and to the various fruits and vegetables adapted to this climate, particularly peaches, plums, and bush berries.

The greater proportion of the type is in a high state of productiveness—a condition due principally to continued heavy fertilization. It is a soil readily improved. The cheapest and most effective means of accomplishing this is deep plowing, systematic crop rotations, including the legumes, the growing of winter cover crops, and the use of barnyard manure. The use of commercial fertilizers can not be entirely discontinued, but the quantity used can be greatly reduced and equally as good, if not better, results obtained.

Ordinarily farm lands of this type of soil may be bought for $70 an acre. Near Rockingham it can not be had for less than $100 an acre.

ORANGEBURG SANDY LOAM.

The surface soil of the Orangeburg sandy loam consists of a grayish loamy sand to light sandy loam, porous in structure and grading into a slightly brown, yellowish, or red material at a depth of 8 to 10 inches. Beneath this there occurs a deep-red, friable sandy clay, the true Orangeburg subsoil. In places the surface soil is a brownish-gray loamy sand, grading directly into the typical heavy, deep-red sandy clay at a depth of 4 to 6 inches. Where the deeper soil occurs the subsurface layer represents a gradational stratum between the surface soil and subsoil proper, which is encountered at an average depth of about 16 inches.

Occasionally a few quartz gravel, varying in diameter from a fraction of an inch to 2 or 3 inches, are scattered over the surface. Such gravelly areas approach the Orangeburg gravelly sandy loam in character. Occasional areas are of rather coarse texture.

The Orangeburg sandy loam occurs only within the western third of the county or to the west of a line dividing the sandhill section from the heavier soils of the area. The territory over which this soil is found increases in width from 3 miles in the extreme south-

western corner of the county to 18 miles along the northern boundary. Within this section areas varying in size from 10 acres to 3 square miles are encountered. One of the largest occupies a ridge extending in a southwesterly direction from near Covington to a point 3 miles northeast of Coleman Mill, and a second large area occurs between Exway and the lowlands along Little River. Another is situated 2½ miles west of Mangum. The most typical development of this soil is found in the smaller areas southwest of Rockingham.

The Orangeburg sandy loam has a level or gently rolling to steeply rolling and hilly topography. Both the surface and underdrainage are good. The most regular areas occur southwest of Rockingham along the River Road and between this road and the Congaree soils of the Pee Dee River lowlands. Not all of the type in this section of the county is level or even gently rolling, but the proportion having a more broken topography is relatively small. The greater part of the area 2½ miles west of Mangum has also a level to gently rolling surface. Areas having a more broken surface configuration usually occupy the hillsides immediately overlooking the Congaree soils or the numerous streams flowing into the Pee Dee or Little River.

The Orangeburg sandy loam is composed of materials derived mainly from the Piedmont Plateau transported and distributed over their present situation by water. The materials have usually been correlated by geologists with the Lafayette formation. Several theories have been advanced as to the manner in which the Lafayette was formed, particularly as to whether its materials were deposited in a formerly existing body of water or spread out over the country by rivers issuing from the Piedmont. This question, however, is of more importance to the geologist than to the farmer and need not be discussed here. Since the deposition of the Orangeburg material there has been considerable change through weathering, and particularly erosion, which has reworked and washed the material to a considerable extent, as evidenced by the present uneven surface configuration of some areas.

Scarcely any of this type remains forested. The original timber growth consisted of longleaf pine, white oak, and post oak. The second growth is shortleaf pine.

The Orangeburg sandy loam is one of the strongest soils of the area and is adapted to a wide range of crops, many of which are not grown at all or to a limited extent only. The principal crops at present are cotton, corn, oats, and some wheat. Near Rockingham and other fertilizer markets acreage applications of 1,000 pounds of a 7–4–4 grade are used on cotton, the yields ranging from three-fourths to 1½ bales per acre, and averaging 1 bale per acre. For corn the average acreage application is 500 pounds of a 7–4–4 mixture and the

average yield is 25 bushels per acre. At a greater distance from railroads less fertilizer is used and all crop yields are lower. Generally speaking, the type is sown to small grain solely for the purpose of following the crop with cowpeas.

The Orangeburg sandy loam is well adapted to the production of cantaloupes, watermelons, Irish potatoes, and various other vegetables, such as beans, peas, lettuce, onions, and beets, but none of these are produced except for home consumption. It is also well suited to such fruits as peaches, grapes, and pears; but, as with the vegetable crops, these are grown only for home use.

This is the soil so extensively and successfully used in the production of peaches in various parts of the Atlantic and Gulf Coastal Plains, as, for instance, in the famous peach-growing section of Fort Valley, Ga.

In the vicinity of Rockingham the Orangeburg sandy loam is in a comparatively high state of cultivation, a condition which has been brought about more through the use of large quantities of commercial fertilizer than by scientific soil management. It is realized by the best planters, however, that the cheapest and most effective means of increasing soil productiveness is through systematic crop rotations, the use of barnyard manure, and improved methods of cultivation. Despite this fact, these practices have not become general.

Most of this type now on the market is held at $100 an acre.

ORANGEBURG GRAVELLY SANDY LOAM.

The Orangeburg gravelly sandy loam consists of 8 to 14 inches of gray to grayish-brown, medium to coarse gravelly sandy loam, of a loose and porous structure, underlain by a dark-red, medium to coarse sandy clay, carrying a small quantity of water-rounded quartz gravel. This gravel varies in size from a fraction of an inch to 3 or 4 inches in diameter and is most noticeable in the surface soil, sometimes forming 15 to 25 per cent of the soil material.

The Orangeburg gravelly sandy loam is confined to the western side of the county, no areas being found east of a line dividing the sand-hill lands from the heavier soils of the county. Typical areas are found southwest of Rockingham along the River Road and between this road and the Pee Dee River. Another lies 4 miles northwest of Rockingham along the Walls Ferry Road. Numerous smaller areas are found in different situations throughout the western section of the county.

The Orangeburg gravelly sandy loam occupies some of the roughest country in the area. A few undulating to gently rolling areas are found, but these are not extensive. In most cases the type occurs on the hill slopes between Orangeburg sandy loam, Norfolk sandy loam, or Greenville sandy loam and the soils in the bottoms

of the Pee Dee River. In the vicinity of Covington the surface is quite broken. Near Mangum a more desirable phase of the type is found. On account of its porous structure and rolling topography, the type is well drained.

The greater proportion of the Orangeburg gravelly sandy loam has been cleared and is now under cultivation. The remainder is forested to pine, white oak, red oak, hickory, and dogwood. The second growth is largely shortleaf pine.

This soil is well suited to the production of cotton, corn, peanuts, and cowpeas. Irish potatoes and other vegetables, such as beans, sweet corn, peas, and onions, do well, but are grown for home use only. Such fruits as peaches, grapes, pears, and raspberries also do well, but none of these are grown for distant markets. Cotton yields range from one-third to 1 bale per acre, averaging about three-fourths bale per acre. Corn yields range from 15 to 25 bushels, the average being about 20 bushels per acre. In the vicinity of Covington the yields are somewhat lower, owing to the fact that less fertilizer is used in that section.

In most places the humus content of Orangeburg gravelly sandy loam is low, a condition which should be remedied by sowing and turning under cowpeas or leguminous crops of some kind.

As an individual soil type the Orangeburg gravelly sandy loam is valued at about $25 an acre. When included in farms with other types of soil, however, it can not be bought for less than $70 an acre.

GREENVILLE SANDY LOAM.

The Greenville sandy loam consists of a brown to brownish-red or dark-red medium sandy loam, 6 to 14 inches deep, underlain by a dark-red, friable sandy clay. In the deeper phases the subsoil is more nearly a sandy loam or loamy sand. Water-rounded quartz gravel are occasionally encountered over narrow strips, especially along the contact of this type and the Orangeburg gravelly sandy loam. That portion of the type having the lightest colored surface soil is usually found where the type joins the Orangeburg sandy loam. There seems to be a direct relation existing between the color of this soil and the clay content, for as the red color becomes more pronounced there is invariably a corresponding increase in the clay content. The sand grains are noticeably rounded.

The Greenville sandy loam frequently occurs in close association with the soils of the Piedmont Plateau, and the separation of this type from the Cecil series was quite difficult in places. A few areas, on account of their small extent, were included with the Cecil. The subsoil of such areas consists of the residual clay characteristic of the Cecil series, but the soil is the same as that of the Greenville

sandy loam. These areas would have been mapped as a distinct soil had they been of sufficient size.

The Greenville sandy loam occurs in small, isolated bodies in the western part of the area. The largest representative area of the type is found about 4 miles east of Pee Dee River, near Roberdell. Other important areas of this type are found southwest of Rockingham along the River Road and between this road and the Pee Dee River.

The topography of the Greenville sandy loam varies from gently rolling and rolling to steeply rolling and hilly. The most even-surfaced portions of the type are found as inextensive interstream areas. The type as a whole is well drained and is a desirable soil for all crops grown in this section of country.

The Greenville sandy loam is probably derived from the Lafayette formation. It is about the same in origin as the Orangeburg soils. In places erosion has removed the original water-deposited Greenville material, laying bare the crystalline rocks over which it was laid down. Such rock outcrops are surrounded by the typical Greenville sandy loam.

Scarcely any of this type remains uncleared, though on small areas there is a second growth of shortleaf pine. The type is one of the strongest and most desirable soils of the county. It is especially well adapted to the production of cotton, corn, and cowpeas, which are now the leading crops grown. Cotton yields three-fourths bale to 1½ bales per acre, averaging 1 bale. The average corn yield is 25 bushels per acre.

Near Rockingham and within a 10-mile radius of a railroad considerable quantities of fertilizer are used. The acreage application for cotton near Rockingham is from 650 to 1,000 pounds. For corn one-half this quantity is considered sufficient.

The average value of this type is $70 an acre, but in many instances it can not be had for less than $100 an acre.

HOFFMAN SANDY LOAM.

The Hoffman sandy loam consists of a light-gray to yellowish-gray, medium to coarse loamy sand to light sandy loam 18 inches deep, underlain to an average depth of 24 inches by a pinkish or pale-red, friable coarse sandy clay. In the lower portion brilliant mottlings of red, yellow, gray, white, and occasionally purple are conspicuous. This variety of colors has given rise to the local term "calico clay."

In places where the surface mantle is less than 3 inches deep the soil has a slightly pinkish tinge, due to admixture of the subsoil material. Generally the immediate surface of those areas having the deeper soil, owing to the presence of organic matter, is darker colored than the material beneath. A characteristic of the type is the pres-

ence of a small quantity of fine quartz gravel and fragments of ferruginous sandstone.

In places the subsoil is very compact and difficult to penetrate with a soil auger, the particles being more or less cemented together, probably, with ferruginous matter. When disturbed or broken down this material has the appearance and feel of a medium to coarse loamy sand. The loaminess is due to the presence of clay, mica, and white, soft material resembling decomposed feldspar.

The type is not widely distributed, none of the areas exceeding a square mile in extent. It is developed as small knolls and ridges throughout the eastern two-thirds of the county. The largest areas occur in the vicinity of Hamlet. The drainage is thorough to excessive.

The Hoffman sandy loam is made up of water-deposited material, but it is not well understood as to just what agencies its peculiarities of subsoil color and structure are due.

The timber growth on the Hoffman sandy loam consists for the most part of black-jack oak. Originally this type supported a valuable growth of longleaf pine, but most of the merchantable timber has been removed.

Only a small acreage of Hoffman sandy loam is under cultivation. Some areas occurring within the Norfolk coarse sand, sandhill phase, and Norfolk coarse sand are planted to cotton and corn. The yields are low unless the soil has previously been planted to leguminous crops and heavily fertilized.

As an individual soil type the Hoffman sandy loam is not highly esteemed. Its value depends upon the surrounding soils.

The following table shows the results of mechanical analyses of samples of soil and subsoil of this type:

Mechanical analyses of Hoffman sandy loam.

No.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
232525	Soil	7.1	26.8	17.5	24.5	8.4	10.6	4.6
232526	Subsoil	7.5	25.6	19.3	15.5	4.0	8.0	19.7

BRADLEY SANDY LOAM.

The Bradley sandy loam consists of 6 to 20 inches of gray to yellowish and occasionally brownish loamy sand or sandy loam to coarse sandy loam, underlain to a depth of 36 inches by a light-red to reddish-yellow, mottled clay or silty clay, varying considerably in texture and color in different localities. A small quantity of rounded gravel and a noticeable content of coarse sand are present in the soil

in a few places, where the type approximates a loose, coarse sandy loam. On some of the slopes and level areas a fine medium sandy loam is encountered.

Where the type borders the Penn silt loam the subsoil is an Indian-red clay and where it touches the Cecil types the stiff, red clay, characteristic of the Cecil series, is encountered. Some variation is also seen in the subsoil in close proximity to the Orangeburg and Norfolk types. Occasionally the subsoil becomes mottled red and yellow and grades at a depth of 3 to 4 feet into the underlying rocks of the Piedmont Plateau.

The Bradley sandy loam occurs to only a limited extent in this county, near the boundary of the Sand Hills and Piedmont section. The largest areas are found east and northeast of Dockerys store and in the vicinity of Ellerbe Springs. Narrow strips are also found in the vicinity of Ledbetter and Roberdell cotton mills.

The topography of the Bradley sandy loam varies from gently rolling to rolling. It occupies the hillsides and foothills along the larger creeks flowing westward into the Pee Dee River. It is also found as gently rolling upland areas lying between the soils of the Coastal Plains province and the residual soils of the Piedmont Plateau.

Owing to its topographic position and to the porous structure of its surface soil, the natural drainage is excellent.

This is a gradational type between the sedimentary or Coastal Plain soils and the residual soils of the Piedmont. To be more exact, the surface portion consists of material similar in character to or identical with the Norfolk sandy loam, while the subsoil has been derived mainly from slate, Triassic sandstone, and granitic rocks. Erosion has played an important part in the formation of this type, as the streams have carried away a large proportion of the Coastal Plain material, leaving only a thin sandy mantle over the residual clays.

The forest growth consists mainly of shortleaf pine, dogwood, red oak, white oak, hickory, sweet gum, and black gum.

The soil is well adapted to the production of cotton, peanuts, corn, and oats. Cotton yields from one-third to 1 bale per acre, with acreage applications of 300 to 800 pounds of an 8–2–2 or 8–3–3 fertilizer mixture. Corn yields from 15 to 25 bushels per acre; oats and rye give fair yields. Irish potatoes, sweet potatoes, and other vegetables and fruits are successfully grown.

Owing to its clay subsoil, the type retains moisture well, the effects of fertilization are lasting, and a fair state of productivity may be attained. The soil, however, is deficient in organic matter, a condition which could be remedied by planting and turning under leguminous crops. It is a mellow and easily tilled soil and one which

responds readily to fertilization. The Bradley sandy loam is valued at $15 to $30 an acre.

The following table shows the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Bradley sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
232519	Soil	13.9	24.6	12.8	22.1	6.6	14.8	4.2
232520	Subsoil	1.7	6.2	3.1	3.9	1.9	45.3	37.9

PORTSMOUTH LOAM.

The Portsmouth loam to a depth of 10 to 24 inches consists of a dark-gray to black fine sandy loam to loam. Beneath this material there occurs a gray or mottled gray and yellow fine sandy clay to sandy clay loam, varying occasionally in texture to a coarse sandy loam.

Only a few small areas of this type occur in Richmond County These lie along some of the smaller streams in the eastern part of the county as flat, level strips only a few feet above the level of the streams. The natural drainage is poor and open ditches are necessary to bring the land into condition for farming.

The Portsmouth loam owes its characteristic features primarily to the poor drainage conditions under which it has been formed. This has favored the accumulation of partially decomposed vegetable matter in the soil, giving it the dark color and preventing aeration and oxidation processes in the subsoil, which has caused the grayish or mottled color of this section of the profile.

With the establishment of proper drainage the type is well adapted to the production of corn, oats, and cotton. Corn yields from 15 to 50 bushels per acre.

CECIL SANDY LOAM.

The Cecil sandy loam consists of 6 to 10 inches of gray to brown loamy fine to medium sand to fine sandy loam, underlain by a brittle red clay, the characteristic subsoil of the granite lands of the Piedmont Plateau. Throughout the type small patches of clay loam or clay are found on the slopes where the surface soil has been washed off.

Only a small area of this soil is found in the county. A few small areas occur in the western portion, mainly between Dockerys Store and Blewett Falls.

The type is characterized by its gently rolling to rolling topography. The surface drainage is excellent.

The Cecil sandy loam owes its origin chiefly to the weathering of granite and gneiss, though it has been influenced more or less by diorite and sandstone, which give rise to local areas having a brownish to Indian-red subsoil. Such areas really represent other types of soil, which are not separated owing to their small extent.

The greater portion of this type is under cultivation, while the remainder is forested pricipally with oak, hickory, pine, and dogwood. The soil is well adapted to cotton, oats, wheat, corn, and clover. Cotton and corn are the principal crops grown at present. The yields compare favorably with those of other types of the Cecil series.

For the most part the soil is deficient in organic matter, particularly in areas that have been under cultivation for some time. This condition is easily corrected by growing such legumes as cowpeas, vetch, and crimson clover, and occasionally plowing under a crop while green. Fall plowing is also decidedly beneficial where a winter cover crop such as crimson clover, bur clover, vetch, oats, or rye follows. Fertilizers relatively high in nitrogen and phosphoric acid give the best results, mixtures of cottonseed meal and acid phosphate, with some kainit, causing decided improvement in most crops.

CECIL GRAVELLY LOAM.

The Cecil gravelly loam to a depth of 4 to 10 inches consists of a gray to reddish-brown gravelly loam. This is underlain by a stiff red clay carrying some angular quartz gravel and extending to a depth of 3 feet. The gravel on the surface and in the soil has given rise to the local term "millstone grit land." In many places the interstitial material is a fine sandy loam. The typical soil contains from 15 to 40 per cent of coarse sand and fine angular quartz gravel. On a few of the slopes and knolls small rounded rocks are quite numerous. This soil type is friable and easily tilled, except for slight difficulties caused by the rock fragments where the quantity of such material is excessive.

Occasionally on some of the slopes the subsoil has a yellow color, particularly where the bedrock comes within 2 feet of the surface. Such areas, however, are not typical and would have been mapped under another name had they been of sufficient size.

The Cecil gravelly loam is confined largely to two main bodies lying along the Pee Dee River south and north of Blewett Falls.

The type occupies the knolls, slopes, and hillsides adjacent to the bottom land (Congaree loam) and in a few instances the bluffs immediately overlooking the Pee Dee River. It possesses excellent

natural drainage, as, owing to the steepness of its surface, the run-off is rapid. In places this causes considerable erosion.

The Cecil gravelly loam represents the residual products of disintegration and decay of coarse-grained granite containing quartz, large crystals of feldspar, and some mica. This rock has weathered to a depth of several feet in many places, but occasionally the soft, rotten granite comes near the surface, and in some instances large bowlders are seen on the surface. Narrow dikes of diorite or similar rock occur in a few places, but these are not of sufficient extent materially to affect the character of the soil as a whole.

The greater part of this land has been cleared and is now under cultivation. The remaining area is forested, principally with oaks, hickory, shortleaf pine, and dogwood.

This soil is well adapted to cotton, corn, oats, wheat, cowpeas, and clover. All crops, cotton especially, fruit well. Cotton yields from one-third to 1 bale per acre and corn from 10 to 25 bushels, according to cultivation and fertilization. Oats do fairly well. Wheat and clover are used to a limited extent only, but both can be grown profitably.

This soil is rich in potash, and a complete fertilizer low in this material will prove equally as profitable as one with a much higher content. Most of the type, the cultivated fields especially, is deficient in organic matter. This constituent should be supplied by growing and occasionally turning under in a green state leguminous crops, of which cowpeas, vetch, crimson clover, and bur clover are particularly well suited to the local climatic conditions. Such crops would not only add the necessary organic matter, but also supply nitrogen gathered from the air by the bacteria living on the roots of this family of plants.

Deeper plowing and even occasional subsoiling would prove beneficial on all of the heavier areas. Fall plowing followed by a winter cover crop such as vetch, crimson or bur clover, rye, oats, or wheat is markedly beneficial.

The Cecil gravelly loam is valued at $20 to $40 an acre, the price being determined mainly by the character of the surface features.

CECIL CLAY.

The Cecil clay consists of 5 to 8 inches of reddish-brown to red clay loam or clay, underlain to a depth of 36 inches by a stiff, tenacious red clay. Frequently a noticeable quantity of sand is present in the first few inches of the surface soil, and cultivation of such areas is easy, owing to the friable nature of the soil. In other areas a high clay content renders cultivation more difficult. Stones are sometimes seen on the surface in considerable quantities.

A small area of the Cecil clay occurs in the county. There are several bodies of this soil situated in the western part of the county close to the Pee Dee River. The largest and most prominent bodies lie east and north of Blewett Falls, while other spots occur here and there throughout the Piedmont section. This type of soil is confined to the slopes, knolls, and ridges, and the topography varies from rolling to very hilly. Erosion has been quite active on some of these hillsides and as a result gullies have been formed. The surface drainage is excellent.

The Cecil clay is a residual soil formed through weathering from granite, gneiss, and gabbro. These rocks in most places have decayed to a depth of many feet. On a few of the slopes the decomposed rocks are exposed at the surface. Owing to the overlapping of the Greenville sandy loam with this type, it was difficult in a few places to draw any definite line between the two types.

The original forest growth consisted of oak, hickory, pine, dogwood, poplar, and cedar. Some merchantable timber is still found on the hillsides, and a few of the once cultivated fields have been reforested with old-field pine, sassafras, scrubby oaks, and cedar pine.

The Cecil clay is particularly well suited to the production of small grains, clovers, and grasses. The rough areas should be seeded and used for pasturage. This is a strong and productive soil and one capable of being built up to a high state of productiveness. The soil should be loosened up, aerated, and filled with vegetable matter. To accomplish this it should be plowed deeper, more thoroughly pulverized, and coarse manures and leguminous crops such as cowpeas, vetch, or clovers turned under.

Cotton, corn, and oats are at present grown upon this type. Cotton yields one-half to two-thirds bale per acre, corn 10 to 25 bushels, and oats about 20 bushels per acre. These yields can easily be doubled by following the suggestions given.

The Cecil clay ranges in price from $15 to $35 an acre, depending upon its location.

IREDELL LOAM.

The Iredell loam consists of 8 inches of dark-gray to black heavy loam, underlain by a yellowish-brown to greenish-yellow, heavy, sticky clay, very plastic and impervious to water. The disintegrated parent rock is usually encountered at a depth of about 30 inches. Numerous black iron concretions are present throughout the soil mass and many diorite bowlders, ranging in diameter from 3 to 24 inches, are found on the surface.

Several small areas in the northwestern corner of the county have been formed through the weathering of diorite dikes which have cut through the Triassic sandstone. The surface soil of these areas

approaches in texture that of the Granville coarse sandy loam or the Granville fine sandy loam, being a coarse to fine sandy loam, yellowish gray in color and sometimes showing a purplish tinge.

The type occupies a comparatively small area in the county. It is found in small, isolated areas along the western boundary, where the typical phase usually occupies knolls and has good surface drainage. In the northwestern corner of the county some areas have a level to flat surface and are poorly drained.

Unlike the Iredell soils mapped in other areas, there is very little blackjack oak on the type in Richmond County, the principal timber growth being shortleaf pine, hickory, white oak, red oak, and dogwood.

None of this soil is under cultivation, with the exception of small scattered areas occurring within more extensive soil types. Cotton generally suffers from "rust" on the Iredell soils. This tendency can be overcome by applications of kainit. The soil is best suited to shallow-rooted crops, such as grain and grass. Its value depends altogether upon that of surrounding soils.

PENN SILT LOAM.

The Penn silt loam to a depth of 4 to 8 inches consists of a light-red to dark Indian-red heavy loam to silt loam or silty clay loam. The surface soil is underlain by a deep Indian-red plastic heavy silty clay, grading into a fine-textured brown to purple sandstone at a depth of 24 to 28 inches. Small flakes of mica occur throughout the soil section and impart to the material a smooth, velvety feel. Spots approaching in color and texture the soil of the Granville fine sandy loam are numerous, the surface soil of such areas being usually a yellowish-gray to slightly Indian-red silt loam to fine sandy loam, about 4 inches deep. One such area occurs about 2½ miles west of Covington.

The Penn silt loam is encountered to the west of a line dividing the Coastal Plains section of the county from the Piedmont section and north of a line drawn east and west through Rockingham. This soil attains its most typical development 3 miles north of Covington. In addition to this area and one 2 miles west of Covington, several smaller bodies are found in the northwestern section of the county, one being found 4½ miles northwest of Rockingham.

The topography of the Penn silt loam varies from level and gently undulating to rolling and hilly. The type owes its origin either directly or indirectly to the weathering of Triassic sandstone. The area to the north of Covington is apparently the bed of an old Triassic sea. It occupies a basin, with hills rising to a considerable height on all sides. The surface of this particular area is level to gently undulating and the soil is poorly drained. The roll-

ing and hilly areas have suffered considerably from erosion, and in many places, especially near the foot of hills, the unweathered sandstone is exposed. The heavy, plastic nature of the subsoil has a tendency to make the type as a whole very retentive of moisture. Open ditches or tile drainage would prove especially beneficial in the least rolling phase of the type.

The native-timber growth on the Penn silt loam consists of shortleaf pine, white oak, post oak, some hickory, and a few cedars. There is considerable merchantable pine on some areas.

Cotton, corn, oats, and wheat are the principal crops. Cotton yields one-third to 1 bale per acre, averaging about one-half bale. Corn produces 10 to 25 bushels per acre, the average being about 15 bushels. Oats produce 15 to 25 bushels and wheat about 10 bushels per acre.

For the permanent improvement of the Penn silt loam drainage is the prime requisite on the lower-lying areas. After this has been done the depth of breaking the soil should be gradually increased from year to year and a systematic rotation of crops inaugurated. In this rotation the legumes should be included, and instead of being cut and used for feed the crop should be dragged down with a roller, cut up with a disk harrow, and turned under with a two-horse plow. Liming at the rate of 1,000 to 3,000 pounds per acre at the time the green crops are turned under will prove especially beneficial not only in correcting acidity but in improving the physical condition of the soil as well. The Penn silt loam is valued at $20 to $50 an acre.

The following table gives the results of mechanical analyses of samples of soil and subsoil of this type:

Mechanical analyses of Penn silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
232535	Soil	0.0	1.4	0.6	6.6	15.8	53.1	22.5
232536	Subsoil	.0	1.1	1.2	1.8	2.0	49.7	44.2

GRANVILLE FINE SANDY LOAM.

The Granville fine sandy loam to a depth of 6 to 14 inches consists of a yellowish-gray fine to medium sandy loam, of rather porous structure. Beneath this surface material occurs a friable fine to medium yellow sandy clay, sometimes mottled with gray and grading at 24 inches into a mottled sandy clay, in which yellow and bright red are the most pronounced colors. Indian red, purple, and greenish yellow are also noticed at this depth. At 30 inches a grayish-brown or brown disintegrated sandstone is encountered. In places the sur-

face soil shows a purplish tinge, which is more noticeable when the soil is wet. Numerous knolls occur showing another variation of the type. Here the surface 4 inches of soil is a dark-gray to purple silty or fine sandy loam.

The Granville fine sandy loam occurs only in the northern part of the county and west of the sand-hill section. No area of the type was mapped at a distance of more than 3 miles south of the northern boundary of the county. The largest bodies are found 3 miles northeast of Covington, near Littles Mills, and in the extreme northwestern corner of the county.

The topography of the type is gently rolling to rolling and hilly. This feature, together with its porous structure, insures good drainage.

The Granville fine sandy loam is a residual soil, derived through weathering from a rather fine grained sandstone of Triassic age. As a rule this sandstone is not weathered to a depth of more than 30 inches, and in many places, especially on the more rolling areas, the disintegrated sandstone comes closer to the surface than this.

The timber growth consists of shortleaf pine, white oak, and post oak, together with some red oak and dogwood.

The principal crops grown are cotton, corn, and oats. They receive practically the same fertilizer and are cultivated in nearly the same manner as the same crops on the Granville coarse sandy loam. The yields are about the same. The type responds readily to fertilizer treatment, as do other members of the series, and is valued at $15 to $40 an acre.

GRANVILLE COARSE SANDY LOAM.

The Granville coarse sandy loam consists of 8 to 14 inches of light-gray or yellowish-gray, loose and porous, medium to coarse sandy loam, underlain by a yellow or yellow and gray friable coarse sandy clay, extending to a depth of 24 inches, where it becomes mottled with bright red, drab, purple, and greenish yellow.

Unlike this type as mapped in other areas, spots carry some water-rounded quartz gravel, ranging from a fraction of an inch to 2 or 3 inches in diameter, scattered over the surface and in the first 2 or 3 inches of the soil. Throughout the type isolated patches are encountered showing a gray surface soil with a purplish tinge, usually of slightly finer textured material than the average for the type, and in some instances more nearly approaching a silt loam than a sandy loam.

The Granville coarse sandy loam is not extensively developed in Richmond County. Only four or five areas were mapped, the largest of which is found 2½ miles northeast of Mangum and the second largest 2 miles northeast of Covington. The smaller areas are found

1 mile north of Covington, 1 mile northeast of Mangum, and a third in the vicinity of Exway. These smaller areas probably represent the most typical development of this soil.

With the exception of an occasional hill, the topography is gently rolling to rolling. The uneven surface configuration, with the open structure of the soil, insures good drainage.

The type is derived from a purplish, coarse-grained Triassic sandstone. That the soil does not normally show the same color as the parent rock would seem to be due to bleaching by the weathering processes. On some of the more sloping areas erosion has kept closely apace with weathering, and as a result the disintegrated sandstone is found near the surface and here the original color is sometimes seen.

The virgin timber growth on typical areas of Granville coarse sandy loam consists of shortleaf pine, white oak, post oak, red oak, and hickory. In a few places longleaf pine and blackjack oak are found, but these areas are infrequent.

The principal crops are cotton, corn, and oats. This soil is also well suited to the production of sweet potatoes, Irish potatoes, and other vegetables, such as beans, peas, cabbage, beets, etc. Peaches, grapes, and pears do well; but, as is the case with vegetables, they are grown for home consumption only.

With an acreage application of 250 to 500 pounds of an 8–2–2 or 8–3–3 fertilizer cotton yields one-third to two-thirds bale per acre. As a rule, corn is not fertilized on this soil. The average yield is about 10 bushels per acre.

In general the Granville coarse sandy loam, like many other types, is not farmed according to the most modern methods. The soil should be broken deeper and more frequently and a systematic rotation of crops followed. The soil is low in humus and should be sown in cowpeas at least once in three years. Much better results will be obtained if the cowpea vines are turned under and allowed to decay in the soil than if they are cut and used for feed. The leguminous crop should be preceded by wheat or oats, the stubble from which will add considerable vegetable matter to the soil. The type is valued at $25 to $40 an acre.

GRANVILLE GRAVELLY LOAM.

The Granville gravelly loam to a depth of 6 to 10 inches consists of a light-gray to yellowish-gray fine sandy loam to silty loam, with an estimated content of 25 to 50 per cent of small, angular quartz fragments and gravel. The soil is underlain by a brownish to reddish plastic clay, extending to a depth of 36 inches, mottled in the lower portions with yellowish gray and red. Even with a high gravel

content the soil is fairly easily tilled and only a little trouble is experienced in securing a stand of crops.

This type forms but a small part of the area of the county, and only one or two bodies of any importance were mapped. The largest area lies along the road between Lenzton and Dockerys Store, and a few small spots are scattered elsewhere in the northwestern part of the county.

The topography is rolling to hilly, the type occupying the ridges and knolls in the locality in which it is encountered. The surface drainage is good, though the plastic nature of the subsoil hinders the downward passage of moisture.

This soil has been formed mainly from the weathering of Triassic sandstone and shale intermixed with granite and gneiss. The large quantity of white quartz found on the surface and in the soil is probably due to quartz veins which existed in the granites and slates.

The larger part of this type is forested with pine, oak, hickory, and a few other hardwoods.

The cultivated portion is devoted to cotton, corn, and oats. The yield of cotton varies from one-third to two-thirds bale per acre, depending mainly upon the quantity of fertilizer used. Corn and oats give only light yields.

ALAMANCE SILT LOAM.

The soil of the Alamance silt loam to a depth of about 6 inches consists of a yellowish-gray to light-gray or white silt loam of floury feel. The subsoil is a pale-yellow to slightly mottled yellow and gray silt loam, which grades into a silty clay at lower depths. In many localities fine slate fragments are found scattered over the surface and through the soil profile. It frequently happens that the soft disintegrated slate comes within 24 inches of the surface soil. When this is the case the surface is strewn with slate fragments.

This type occurs in small bodies in the northwestern part of the county, where it is always associated with the Georgeville silt loam. The Alamance silt loam has gently rolling to rolling surface features and good drainage, except in a few slightly depressed areas, which can be drained easily by open ditches.

This type has been derived from the weathering of the "Carolina slates." These grayish to bluish rocks are usually fine grained and weather into a smooth, mellow soil possessing a velvety feel and containing a high content of silt.

The forest growth consists of white oak, post oak, blackjack oak, and pine.

The soil is usually low in organic matter and in places has a tendency to compact. It is well suited to the production of small grains

and grasses. It would furnish excellent pasturage for cattle and sheep.

Cotton, corn, and oats are grown to a greater or less extent, and the yields depend upon the quantity of fertilizer used and the methods of cultivation. Cotton produces one-third to two-thirds bale per acre, corn 10 to 20 bushels, and oats 15 to 25 bushels. By plowing under green manuring crops and adding barnyard manure this soil can be made to produce fair and even large yields of corn, oats, and wheat. The Alamance silt loam sells at $15 to $25 an acre.

The following table shows the results obtained from a mechanical analyses of samples of soil and subsoil of this type:

Mechanical analyses of Alamance silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
232515	Soil	1.4	2.4	1.4	2.0	2.2	78.9	11.1
232516	Subsoil	.4	1.3	.8	1.3	.5	69.8	25.6

GEORGEVILLE SILT LOAM.

The Georgeville silt loam consists of 4 to 8 inches of red to reddish-brown, smooth, mellow silty loam, underlain by red silty clay, slightly mottled with yellow below 14 or 18 inches. At 24 inches or deeper the disintegrated slate is almost invariably encountered. Varying quantities of slate fragments are scattered over the surface and through the soil mass. One of the most important variations from the typical soil—a variation occurring in rather large areas—possesses a deep-red surface soil, more compact in structure than the average of the type. The latter condition is due, in part at least, to an absence of slate fragments. It also frequently happens that the surface soil of this type is a grayish silty loam, passing into a reddish-yellow material of the same texture and structure at a depth of 24 inches. Throughout the type, areas with a reddish-yellow subsoil are encountered.

Those areas having a red surface soil are underlain by a dark-red clay, which upon casual inspection resembles the Cecil subsoils. Upon closer examination, however, it is found that this material is very silty, contains no sand, and in many places there may be seen in the undisturbed subsoil the original slaty cleavage.

The Georgeville silt loam is confined to a relatively small area. It is the predominating soil between Blewett Falls and Covington and extends northeast of Covington along Big Mountain Creek to the northern boundary of the county. A considerable area is also found east of Ellerbe.

The topography is varied. As a whole, it is rolling to steeply rolling and hilly, becoming more decidedly hilly and even abruptly broken along some of the streams. Small areas are found having a flat surface, but these are few in number. In general it may be said that this type has a more uneven surface than any other type of the area. Except for the few flat areas, the natural surface drainage of the type is well established. In those areas beneath which the parent rock is more deeply weathered streams have cut deep, narrow valleys and the rapid run-off of rains has carved out numerous small ravines with rounded and gently sloping hills intervening.

The Georgeville silt loam is a residual soil, derived through the agencies of weathering from the "Carolina slates." The great variation in color and depth are evidently due to different stages of weathering through which the slate is passing and also to differences in rate of erosion. It is to the complete oxidation resulting from deeper and more thorough weathering that the red color of local areas is due.

The timber growth on this type consists of oaks and hickory, together with considerable areas of merchantable shortleaf pine.

This type is well suited to the production of wheat, oats, corn, clover, and cotton. On hills and slopes where late frost is not likely to occur the soil will produce excellent apples, peaches, and various other fruits. In some counties in the State the type produces good yields of wheat, oats, clover, and grasses. In Richmond County the type produces one-third to 1 bale per acre of cotton, 10 to 30 bushels of corn, and 15 to 40 bushels of oats. Irish potatoes, cabbage, and other vegetables do well. The yields of all crops on this type can be greatly increased by deeper plowing and more thorough preparation of the seed bed. Liberal applications of stable manure will prove especially beneficial to all crops. The soil is well suited to most of the legumes, the growing of which will also greatly increase the yields of subsequent crops. This type is valued at $15 to $50 an acre.

The following table shows the results obtained from mechanical analyses of samples of soil and subsoil of this type:

Mechanical analyses of Georgeville silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
232507	Soil	3.0	6.2	2.9	3.4	1.7	63.9	18.4
232508	Subsoil	.6	3.1	1.7	1.7	.3	61.6	30.5

ALTAVISTA SILT LOAM.

The soil of the Altavista silt loam to a depth of 8 to 12 inches consists of a compact gray to slightly yellowish gray silt loam, usually

darker colored in the surface 2 or 3 inches, owing to the presence of organic matter. The subsoil to a depth of 16 to 20 inches is a dull-yellow or drab silty clay to sandy clay showing distinct yellow mottlings. Below 20 inches the material is predominantly drab and as depth increases red mottlings are occasionally seen.

In texture this type is not uniformly a silt loam. In places there is intermixed with the silty material a greater quantity of fine and medium sand and spots occur which are a fine to medium sandy loam. On account of its predominatingly fine texture, this soil when virgin is compact and rather difficult to break. When once broken, however, it is mellow and easily tilled.

The Altavista silt loam comprises a relatively small acreage. The largest body is a triangular V-shaped area lying between Little River and Buffalo Creek. A second area of considerable size parallels Little River on the west side for a distance of about 2 miles. A smaller body, which is not typical, is found a short distance north of Dumas Ferry.

The surface of this type is nearly flat. It invariably occurs only a short distance from streams, toward which there is always a very gentle slope. In many instances, however, the slope is not great enough to carry off surface waters unless aided by properly located ditches.

The Altavista silt loam is an alluvial soil occupying the second bottoms of streams. The materials composing it are the weathered products of granite, gneiss, diabase, diorite, and slate, with many other igneous and metamorphic rocks, which products have been brought down by water from the mountains and the Piedmont Plateau and deposited in their present position during periods of overflow. At the time of deposition of these materials they occupied first bottoms, but changes in the level of streams have left them 1 to 3 feet higher than the present first bottoms. The type overflows only during seasons of excessively high water.

The virgin timber growth on the Altavista silt loam consists of shortleaf pine, white oak, dogwood, black gum, maple, elm, water oak, and ash. The pine is for the most part merchantable and is rapidly being removed.

Scarcely any of this type is under cultivation. A few small areas are planted to cotton, corn, and oats, and the yields, especially of corn and oats, are good. When drained the type is particularly well suited to the production of corn and small-grain crops. The growing of cotton should be profitable on the higher lying areas. For cotton a fertilizer running high in potash will prove especially beneficial on this soil.

For the permanent improvement of this soil drainage is the prime requisite. Underdrainage with tiles should prove the most satis-

factory means of reclaiming it. The type is valued at $30 to $40 an acre.

ALTAVISTA LOAM.

The typical Altavista loam consists of a mellow, light-gray to dark-gray silty loam to fine sandy loam, passing into a pale-yellow silty loam to fine sandy loam at a depth of 8 inches. This pale-yellow stratum extends to an average depth of 12 inches, where a heavy, friable to plastic silty or fine sandy clay of yellow color is encountered. Ridges occupying a slightly more elevated position than the average of the type occur occasionally, the soil of such areas being usually more nearly a fine to medium sandy loam, underlain at a depth of 10 to 12 inches by a pale-red, fine to medium sandy clay. In several instances slight depressions in the type are occupied by a dark-gray to grayish-black very heavy silty loam or clay loam, resting upon a plastic and sticky yellow silty clay. The subsoil of this phase sometimes presents red or drab mottlings in its lower depths.

The Altavista loam is found only in the northwestern section of the county. It occupies more than one-half of the entire area between Little River and the Pee Dee River and is typically developed near Pee Dee Church and to the south and southwest of Mangum.

The surface of the type is level to gently undulating and gently rolling. The natural drainage over the greater part of the type is well established. The surface has sufficient slope to carry away water, and yet is not rolling enough to induce erosion. It has been necessary to establish artificial drainage in a few depressions, and in this way some of the most fertile areas have been brought under cultivation.

The greater proportion of the Altavista loam is of alluvial origin. The type occupies third and fourth terrace positions, and the soil materials consist of sediments brought down by the Pee Dee and Little Rivers when these streams flowed at higher levels than at present. These sediments can be traced to the various igneous and metamorphic rocks of the Piedmont Plateau. Between the Congaree soils occupying the first bottoms of streams and the Altavista loam of the third and fourth bottoms there usually occur very narrow strips of a second terrace soil—Altavista silt loam—which would have been separated had the areas been large enough to show on a map of the scale used in this survey. To the north of Mangum and in some other localities the silty or fine sandy surface covering of alluvial material becomes very thin and in places diorite dikes and Triassic sandstone are exposed. It is very probable that this entire section of country was at a former period covered by the Tri-

assic formation, for wells sunk through the alluvial materials usually encounter the Triassic sandstone at a depth of not more than 35 feet.

The Altavista loam is naturally a strong and productive soil and is one of the most desirable types of the area. Cotton, corn, and oats are the principal crops and the yields, especially of cotton and corn, are excellent.

The following table shows the results obtained by mechanical analyses of samples of soil and subsoil of this type:

Mechanical analyses of Altavista loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
232523	Soil	5.0	11.1	7.3	12.8	8.3	46.9	7.7
232524	Subsoil	3.2	8.6	6.8	13.7	5.1	34.7	28.4

CONGAREE FINE SAND.

The typical Congaree fine sand consists of 6 to 10 inches of grayish-brown to chocolate-brown fine sand or mellow, loamy fine sand, underlain by fine sand or loamy fine sand of a uniformly mellow structure and a slightly darker color than the surface soil. Frequently the fine sandy subsoil stratum passes at a depth of about 24 inches into a light-brown fine sandy loam or loamy fine sand, and in some instances there is encountered at a depth of 24 to 30 inches a silty or fine sandy clay. Throughout the areas occupied by this type small depressions are found which are, as a rule, occupied by the Congaree fine sandy loam or Congaree loam.

This type occupies a comparatively small area in the county. It is found only within the lowlands or first bottoms of the Pee Dee River, where it occurs as a narrow band lying next to the river. The widest area of the type occupies an island in the northwestern corner of the county. Usually the Congaree fine sand is slightly more elevated than the surrounding soils and its surface is level to gently undulating. The type is subject to overflow, but is not flooded as often as the Congaree loam.

The Congaree fine sand is an alluvial soil composed of material deposited from the overflow waters of the Pee Dee River. The material has been washed from the mountain and Piedmont country lying in the drainage basin of the river. Its occurrence immediately next to the river is due to the assorting power of currents of varying velocity, the larger particles forming the type being laid down on the river banks at the first checking of the currents, and the finer Congaree loam being deposited at a greater distance from the river where the currents become more sluggish.

Scarcely any of this soil supports a forest growth. The original growth was ash, elm, sycamore, water oak, dogwood, and some pine. The type is well suited to the production of corn, oats, and cotton. Corn yields 35 to 90 bushels per acre, oats 40 to 60 bushels, and cotton three-fourths bale to 1½ bales per acre. Owing to the fact that it is better drained, the Congaree fine sand is a more desirable cotton soil than the Congaree loam.

The Congaree fine sand is valued at $30 to $40 an acre.

CONGAREE LOAM.

The surface soil of the Congaree loam is a mellow, grayish-brown to chocolate-brown loam or silt loam, varying in depth from 6 to 10 inches. Throughout the type areas of a heavy fine sandy loam are encountered, but these are not large enough to show on a map of the scale used in this survey. Those areas occupying the lowlands along the streams passing through the Georgeville silt loam are very silty in texture, and are usually darker colored than the average of the type. Near the source of smaller streams the type is more nearly a fine or medium sandy loam, and would have been mapped as such had the areas been larger.

The subsoil of the Congaree loam is very similar to the surface soil in all of its properties except color. It is a light-brown, brown, or chocolate-brown loam or silt loam, grading at times into a silty clay. The largest areas of the type occupy the first bottoms along Pee Dee and Little Rivers and a similar position along the larger creeks which flow through the Piedmont section of the county and eventually reach one or the other of these rivers. Among these creeks may be mentioned Falling, Cartledges, Little Mountain, Big Mountain, Little Buffalo, Buffalo, and Hamer.

The topography of the type is flat to gently undulating, and over the greater part of it the drainage is not well established. Its entire area is subject to overflow, and its value can be greatly enhanced by underdrainage.

The Congaree loam is an alluvial soil. That part of it occupying the lowlands along Pee Dee and Little Rivers has been formed of material brought down from the mountains and Piedmont Plateau and deposited in its present position during periods of overflow. As it occurs along the creeks the type is derived mainly from soils coming principally from the decay of rocks of the Piedmont section of Richmond County, though some of the materials come from the Coastal Plains section of the county.

The greater part of Congaree loam is under cultivation. The remaining portion is forested to ash, elm, water oak, wild cherry, maple, sweet gum, black gum, pine, and sycamore.

The type is admirably adapted to the production of corn and oats, and in some places wheat does well, but this is not true for the type as a whole. With favorable seasons it produces good yields of cotton also, and in the northwestern corner of the county it is extensively used for this crop. With an acreage application of 500 pounds of an 8–2–2 or an 8–3–3 fertilizer cotton produces 1 bale per acre or more. Oats as a rule are not fertilized. The yield varies from 50 to 60 bushels per acre. Formerly corn on this type was not generally fertilized, but recently applications of an 8–2–2 or 8–3–3 mixture have been given. Yields range from 35 to 90 bushels per acre. The average wheat yield is not over 10 bushels per acre. This type gives excellent yields of cowpea hay, but the vines do not fruit well.

The Congaree loam is held in high esteem as a corn and oats soil. It is valued at $30 to $40 an acre.

The following table shows the results obtained from mechanical analyses of samples of soil and subsoil of this type:

Mechanical analyses of Congaree loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
232511	Soil	0.3	0.8	0.5	16.9	13.8	52.8	14.7
232512	Subsoil	.0	1.6	1.3	19.9	13.8	45.2	18.2

SWAMP.

The areas mapped as Swamp in Richmond County embrace the very wet lands lying along streams. Much of this land is saturated throughout the year and all of it is subject to overflow. The materials comprising the soils are mixed. On an average the type along the smaller streams consists of 6 to 20 inches of a dark-gray to black, medium to coarse mucky sand. In places where the materials comprising the soil have accumulated as a result of backwater rather than running water the mineral matter is mostly fine sand, silt, and clay, and the soil is inherently very fertile. In some of these locations the organic matter content is so high that the soil resembles muck.

The subsoil of Swamp is also quite variable. Along the smaller streams it is usually a gray or drab medium to coarse sand or sandy clay, frequently showing yellow or reddish iron stains in its lower depths. Along the larger streams it is usually a light-gray to nearly white, medium to coarse sand, saturated with water. Occasional beds of fine quartz gravel are encountered.

The largest Swamp areas occupy low, flat lands along Drowning, Naked, Marks, Solomons, Falling, Hitchcock, and Rocky Fork Creeks and Ghock Fork.

This type is forested to black gum, sweet gum, a few pines, bay, and some poplar. In the area along Drowning Creek there is considerable cypress. A dense undergrowth of reeds and briers is found on all areas.

In its present condition Swamp can not be used for farming, but if cleared and drained some areas would prove especially valuable for corn, oats, onions, and cabbage. The areas underlain by coarse white sand and fine gravel saturated with water have no agricultural value.

SUMMARY.

Richmond County, with an area of 464 square miles, or 296,960 acres, is situated in the south-central part of North Carolina, along the South Carolina State line. The surface is characterized by a chain of hills traversing the county in a general north and south direction, and east of this by a Sandhill region, with gently rolling and rolling topography. The northwestern corner of the county is mainly occupied by gently sloping stream terraces, while south of Rockingham there occurs a narrow strip of country whose surface is undulating to gently rolling.

The regional drainage of the county is, for the most part, to the southwest and into the Pee Dee River, which forms its western boundary. Naked Creek, flowing southeast into Drowning Creek, drains the northeastern section of the county. Along the numerous streams of the county much water power has been developed.

The population of the county in 1910 was 19,673. Rockingham, the county seat, with a population of 2,155, is situated in the midst of a thriving cotton-mill section. Hamlet, with about the same population as Rockingham, is an important railroad center.

Four railroads—the Seaboard Air Line, the North & South Carolina, the Aberdeen & Asheboro, and the Rockingham Railroad, now under construction—afford excellent transportation facilities.

Much of the soil of the county is in a state of high productiveness, yet there is much room for development along agricultural lines. The Sandhill region, which attracted no attention until recent years, is rapidly developing in some localities. Cotton, corn, and oats are the principal crops.

The soils of the county are derived from material of two great soil provinces—the Piedmont Plateau and the Atlantic Coastal Plain. The former is made up of granite, gneiss, and diorite formations, giving rise to Cecil and Iredell soils; the Carolina slates, giving rise to the Georgeville and Alamanee series; and Triassic sandstone, giving rise to the Granville and Penn series. The Coastal Plain province as here represented embraces two formations—the Lafayette and

Columbian. The Lafayette forms soils of the Greenville and Orangeburg series and, in part, to one type of the Norfolk series.

The Columbia gives rise to the Norfolk and Portsmouth series, to one miscellaneous type, the Hoffman sandy loam, and to areas classified as Swamp.

Three members of the Cecil series occur in the area—the gravelly loam, the sandy loam, and the clay. The first named is known locally as "millstone grit land" and is a strong Piedmont soil, fairly well adapted to cotton and corn. It can be used to advantage for clover and grasses. The sandy loam type is not extensively developed. Yields reported from this type compare favorably with those of other members of the Cecil series. The clay member of the series is a strong soil, well suited to the staple crops and to grasses.

The Iredell loam is a nonagricultural soil in this county.

The Georgeville silt loam, though for the most part rough, is a fair soil for cotton, corn, and wheat. It can be used to advantage as a grazing soil.

The Alamance silt loam produces one-third to two-thirds of a bale of cotton per acre and an average of 10 bushels of corn per acre. It is a fair wheat soil.

The Granville gravelly loam has a stony surface, but is fairly easily tilled and gives yields comparing favorably with those of neighboring types. The coarse sandy loam is considered an average soil for cotton and corn. The fine sandy-loam type yields on an average of one-half bale of cotton and 15 bushels of corn per acre.

The Penn silt loam when well drained gives fair returns of cotton, corn, and oats.

The Altavista loam is an easily tilled soil, well adapted to all the crops common to this section of North Carolina. The Altavista silt loam is a second terrace soil. It is not extensively cultivated.

The Congaree fine sand, an alluvial type, is an excellent soil for corn and oats. Some cotton is also grown. The Congaree loam is particularly well suited to corn and oats.

The Bradley sandy loam represents an overlapping of the Coastal Plain and the Piedmont Plateau provinces. It is an easily tilled soil, retentive of moisture, and fairly well suited to all the staple crops.

The Greenville sandy loam is one of the strongest soils of the area, producing from three-fourths bale to 1½ bales per acre of cotton and an average of 25 bushels of corn.

The Orangeburg sandy loam is highly esteemed for cotton, corn, and oats. The average cotton yield is 1 bale per acre. The gravelly sandy loam is somewhat difficult to cultivate, but gives yields only slightly lower than the sandy-loam type.

The Norfolk coarse sand, Sandhill phase, is the most extensive soil type of the area. The best portions of this soil, with careful fertiliza-

tion and tillage, produce two-thirds of a bale of cotton per acre and fair yields of corn. Small areas are not suited to agriculture. Practically the same conditions apply to the coarse sand type. The sandy-loam member of the Norfolk series is highly esteemed for cotton and corn. With heavy fertilization it will yield an average of 1 bale of cotton per acre and 25 bushels of corn.

The Hoffman sandy loam occupies rolling areas and is not considered a desirable agricultural soil.

The Portsmouth loam is the most inextensive type of the area and is an unimportant soil.

Swamp consists of poorly drained areas lying along streams. If drained some areas would prove very valuable for corn and oats.

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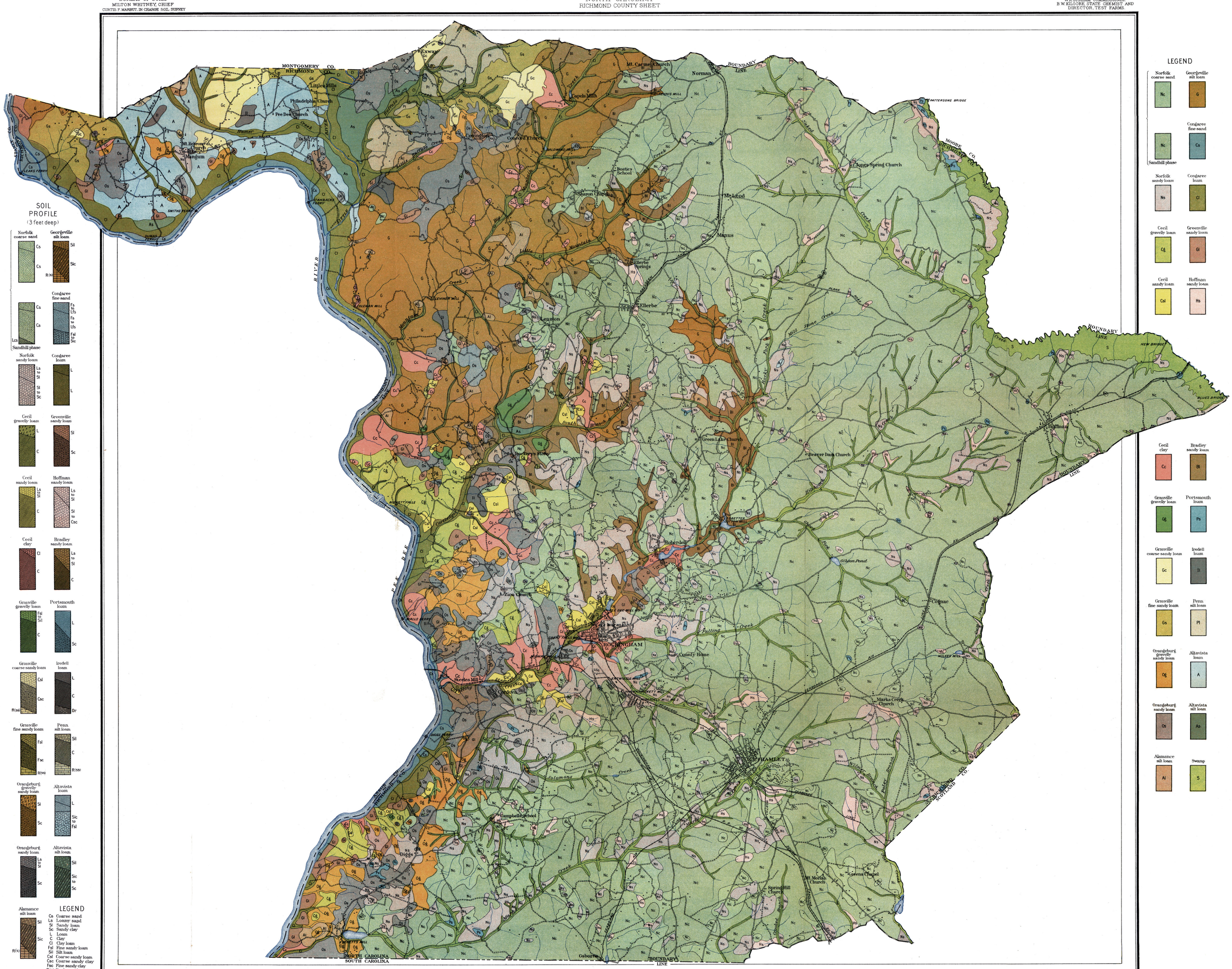
U.S. DEPT OF AGRICULTURE
BUREAU OF SOILS
MILTON WHITNEY, CHIEF
CURTIS F. MARBUT, IN CHARGE SOIL SURVEY

SOIL MAP
NORTH CAROLINA
RICHMOND COUNTY SHEET

NORTH CAROLINA
DEPARTMENT OF AGRICULTURE
W.A.GRAHAM, COMMISSIONER
B.W.KILGORE, STATE CHEMIST AND
DIRECTOR, TEST FARMS



SOIL PROFILE
(3 feet deep)

LEGEND

Cs	Coarse sand
Ls	Loamy sand
Sl	Sandy loam
Sc	Sandy clay
L	Loam
C	Clay
Cl	Clay loam
Fsl	Fine sandy loam
Sil	Silt loam
Csl	Coarse sandy loam
Csc	Coarse sandy clay
Fsc	Fine sandy clay
R(ss)	Rock-sandstone
Sic	Silty clay
Fs	Fine sand
Lfs	Loamy fine sand
Dr	Decomposed rock
R(s)	Rock-slate
Lcs	Loamy coarse sand

LEGEND

Hugh H. Bennett, Inspector in charge Southern Division
Soils surveyed by R.B.Hardison, W.Edward Hearn
and Risden T. Allen of the U.S.Department of Agriculture
and L.L.Brinkley and E.W.Thornton of the North Carolina
Department of Agriculture

1 0 1 2 3 4 Miles
Scale 1 inch -1 mile

Field Operations
Bureau of Soils
1911